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ABSTRACT

The association of anxiety and medical students' performance on the National Board of Medical Examiners (NBME) Part I Examination was investigated. The Debilitating Anxiety Scale was completed by 62 second-year medical students before taking the NBME Examination. Debilitating test anxiety has been described as anxiety that interferes with test performance. Based on their responses to the scale, the students were categorized as either high, moderate, or low test-anxious. Each group included approximately one-third of the participants. Test anxiety was found to be significantly associated with performance on the NBME Part I Examination. The mean Part I score of the low test-anxious group was significantly higher than that of the high and moderate test anxious groups; however, there was no difference between the latter two groups' scores. The results suggest that there may be varying thresholds related to test anxiety levels. But when the thresholds are reached for students with differing levels of test anxiety, performance differences are likely to be diminished. (Author/SW)

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COMPARING PERFORMANCES OF LOW, MODERATE AND HIGH TEST-ANXIOUS MEDICAL STUDENTS ON THE NBME PART I EXAMINATION

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EXPLORING PERFORMANCES OF LOW, MODERATE, AND HIGH TEST-ANXIOUS STUDENTS ON PART I OF THE NBME EXAMINATION

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ABSTRACT

The association of anxiety and medical students' performance on the National Board of Medical Examiners (NBME) Part I Examination was investigated. Sixty-two second year medical students completed the Debilitating Anxiety Scale before taking the NBME Examination. Based on their responses to the scale, the students were categorized as either high, moderate, or low test-anxious. Test anxiety was found to be significantly associated with performance on the NBME Part I Examination. Secondly, the mean Part I score of the low test anxious group was significantly higher than that of the high and moderate test anxious groups; however, there was no difference between the latter two groups' scores. The results suggest that there may be varying thresholds related to test anxiety levels. But when the thresholds are reached for students with differing levels of test anxiety, performance differences are likely to be diminished.

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The academic experiences of many medical students and the general state of anxiety are often viewed as being related (1-4). Although there appears to be general interests in the effects of anxiety on the performance of medical students, few studies have focused on medical student populations. Because medical schools are prime anxiety producing environments for many students (5-6), the lack of studies on the effects of test, particularly test anxiety, on medical students' performance points to the need for further exploration in that area.

According to a widely accepted definition, test anxiety is the tendency to emit interfering responses under test-taking situations and is assumed to hinder test performance (7). But evidence regarding the effects of test anxiety on test performances of baccalaureate and post baccalaureate students has been conflicting. Some studies report that test anxiety is correlated with performance (8, 9, 10) whereas others report that there is no substantial relationship between anxiety and performance (11, 12). However, most of those studies employed analog tests which provided only speculative information regarding the effect of test anxiety on actual exam performance. But three early studies, which provided the framework for this study, used in-course examinations and the results also indicated that there

was little relationship between test anxiety and performance; for example, test anxiety accounted for only three to four per cent of the performance variance (13-15).

The results of the few studies on test anxiety's effects on actual test performance are inconclusive, thus additonal studies are still needed in the effort to reach a logical conclusion pertaining to test anxiety's effects on actual examinations. Further, because there has been little investigation of test anxiety's relationship to the performance of educationally elite students' performance on stress provoking examinations, the purpose of this explorative study is to examine the relationship between test anxiety and medical student performance on an important standardized examination that is perceived to be very important to most medical students, the National Board of Medical Examiners (NBME) Part I Examination.

The NBME Part I Examination covers the basic and behavioral sciences presented in the first and second years of medical school. For the students in this study, the examination was critical, passing the examination was required for promotion to the third year. Moreover, the students had to pass the examination to be 1) promoted, 2) graduated, and 3) licensed to practice medicine (it is the first of three examinations in the most widely used medical licensure procedure). Under those circumstances, the assumption that the NBME Part I Examination was perceived by the students as an important test is compelling.

Using students' NBME Part I scores, two questions concerning test anxiety and performance were addressed: 1) Does test anxiety account for a significant amount the performance variance? 2) Does a test anxiety to performance relationship exist? If so, is it in the direction assumed by most test anxiety investigators, i.e., an inverse performance-to-test

anxiety relationship where high test anxiety is associated with lower performance.

METHODOLOGY

Sample

Sixty-two second-year medical students (58 percent of the class) at a major medical school attended a presentation on test-taking skills and agreed to participate in the study. The students were given the Debilitating Anxiety Scale (DAS). Each student was placed into one of three groups in accordance to responses on the DAS. The groups were based on levels of test anxiety--high, moderate, and low. Twenty-one students were placed in the high test anxiety group; twenty-one were placed in the moderate test anxiety group; and twenty were placed in the low test anxiety group.

Instrument

The 10-item Debilitating Anxiety Scale (DAS), developed by Alpert and Haber (16), was used to identify individuals who are predisposed toward high, low, or moderate levels of debilitating test anxiety. Debilitating test anxiety has been described as anxiety that interferes with test performance. The DAS was used because it is a brief, well known scale that purportedly addresses the negative effects of test anxiety on test performance. The DAS has high internal consistency with a reported test-retest reliability coefficient of .87 after a 10 week interval, and it correlates .60-.70 with other recognized test anxiety measures (17).

Dependent Variable

NBME Part I Examination performance was employed as the dependent variable. The examination is a two-day norm-referenced standardized test

containing approximately 950 items that covers seven disciplines. It is reported to have high reliability, usually above .90, as measured by the K-R 20 (17). A passing standardized score for Part I is 380, which is 1.2 standard deviations below the normed mean of 500.

Procedures

During the mid-point of the spring semester, a presentation on test-taking was offered to the second-year class, and 58 percent of the class attended. Those not attending either had schedule conflicts, prior commitments, were absent from classes that day, forgot about the presentation or had no interest in the topic. Before the presentation, the attending students were requested to complete the DAS. Sixty-two students (100 percent who attended the presentation) voluntarily completed the scale. Levels of test anxiety were based on DAS scores: participants were placed in either low, moderate of high groups. Each group included approximately one-third of the participants.

DAS score ranges for the low, moderate, and high test anxious students were 15-24, 25-30, and 31-42, respectively. After completing the spring semester, the students sat for the June administration of the NBME Part I Examination. The students' NBME Part I scores were recorded and analyzed with the DAS results to examine whether test anxiety had an associated effect on students' performance.

To address some of the study's methodological limitations two procedures were used. First, to determine if inter-group differences that might be confounding existed in academic performance, first-year medical school grade point averages of the three test anxiety groups were examined. Using analysis of variance, no significant group differences ($F = 1.23$, $df = 2/79$) indicating the three groups had statistically similar prior academic

performances. Second, to discern if the 46 students who did not participate in the study differed on the dependent variable from those who did participate, participant and nonparticipant mean NBME Part I Examination scores were examined. A neglible t-test ratio ($t = 0.69$, $df = 106$) indicated that the scores of the participants and nonparticipants were statistically similar. These findings somewhat enhanced the generalizations that may be made from the subsequent results.

RESULTS

Using anlysis of variance, it was found that test anxiety accounted for a significant ($F = 4.40$, $df = 2/59$, $p, < .02$) amount of the variance, 13 percent, in the NBME Examination performance. The mean scores of the three groups, shown in Table I, indicated that the low test anxiety group achieved the highest score, whereas the scores for the moderate and high test anxiety groups were quite similar. Tukey's HSD test was applied to examine pair-wise differences between the three groups Part I NBME examination mean scores. The post hoc procedure confirmed that the mean score of the low anxiety group was statistically greater than both the high and moderate test anxiety groups. The mean scores of the moderate and high test anxiety groups were found not to differ statistically.

The similarity in performance between the high and moderate groups suggested a nonlinear relationship between test anxiety and NBME examination scores. A curvilinear relationship was confirmed when the data was found to fit a quadratic function ($R = .37$, $F = 4.62$, $df = 2/59$, $p < .05$).

TABLE I

NBME Part I Means, Standard Deviations, and
Range of Low, Moderate, and High Test Anxiety Groups

Group	N	Mean	SD
Low	20	561.750	71.013
Moderate	21	495.238	56.491
High	21	501.190	74.965

DISCUSSION AND IMPLICATIONS

As indicated by the results, unlike the three previously cited studies that served as frameworks for this study (13-15), a greater percentage of performance variance was explained by test anxiety. Further, as found in the earlier studies, students in the low test anxiety group attained higher scores than those in the high and moderate test anxiety groups, but when compared, the mean performances of the high and moderate test anxiety groups did not differ statistically. Both groups' mean scores approximated the norm mean of 500.

Although the high and moderate test anxiety groups' performances were quite similar, the expected linear direction of the mean performances (based on earlier studies) was not observed; i.e., the mean performance of the moderate test anxious students was not, as expected, greater than their high test anxious counterparts. The resulting mean performance of the high anxiety group was actually higher (although insignificantly so) than that of the moderate group. But the performance of the low test anxiety group was substantially higher than both the high and moderate test anxiety groups.

The mean NBME Examination score of the low test anxious students was approximately one standard deviation greater than the mean scores of the high and moderate test anxious students.

The results suggest that for critically important examinations such as the NBME Examinations where a lot is at stake for the test-taker, students with low test anxiety levels may have an advantage with regards to performance. This suggests that test anxiety associated with high stress related examinations may contribute to greater performance variance than that observed for perceptibly less threatening tests. Course examination may be examples of the latter, and indeed the low test anxious students' overall course performances did not differ from their high and moderate test anxious peers. But the differenes were substantial when the low test anxious students' NBME Examination scores were compared to their high and moderate test anxious peers.

One possible explanation is that for performance on tests that are perceived as being highly important, high and moderate test anxious students are more prone than low test anxious students to test-anxiety's interfering effects on performance. Although high and moderate test anxious students probably have different thresholds or tolerance levels regarding test anxiety, once the threshold is reached, performance differences between groups with varying test anxiety levels will diminish.

Thus, because the NBME Examination is generally perceived as a critical test for many medical students, the observed similar mean performances of the high and moderate test anxious students may be attributed to the lower test anxiety thresholds of those two groups. Further, because of the lower thresholds (compared to that of the low test anxious students), the expected difference between group performance was diminished. With regard to low

test anxious students, on other hand, despite the stress generally associated with the NBME Examination, the level of test anxiety may not have reached the point where performance was affected to the same degree observed for the high and moderate test anxious students. The threshold effect may have thus accounted for the low test anxiety groups' higher mean performance and the curvilinear relationship (resulting from the similar performances of the high and moderate test anxious students).

With regards the hypothesized threshold effect, a test may be perceived as so important to students, that despite their predisposition toward particular test anxiety levels if anxiety thresholds are reached, the expected differences in mean performance between students in varying test anxiety groups will be diminished or alleviated. This seems to be one way to describe what seems to have generally occurred for the high and moderate test anxious students in this study.

Because the results suggest that test anxiety is associated with test performance, further exploration in the area of test anxiety and performance on actual examinations is needed. Certainly an exploration to confirm the existence of a possible threshold effect is warranted. Finally, this study provides further evidence of the need to understand more about the effects of test anxiety on performance in real-life situations.

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